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648.43120CX1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appellants: MAKINO et al
Serial No.: 10/812,087
Filed: March 30, 2004
For: Vacuum Processing Apparatus
Group: 1763
Examiner: K. Moore

APPELLANTS' BRIEF

Mail Stop: Patent Appeals (Fee)
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

August 7, 2006

Sir:

This Appeal Brief is being submitted under 37 CFR 41.37 in connection with the appeal of the above-identified application, a Notice of Appeal having been filed on June 5, 2006 within a Request a Reconsideration, filed on such date.

REAL PARTY IN INTEREST

The real party in interest is Hitachi High-Technologies Corporation of Japan.

RELATED APPEALS AND INTERFERENCES

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This appeal involves an application which is a continuation of parent Application Serial No. 10/656,334. Another appeal is being filed in conjunction

Application Serial No. 10/812,086, which is also a continuation of the same parent application Serial No. 10/656,334.

STATUS OF CLAIMS

Claims 1 - 6 have been canceled leaving claims 7 - 19 pending in this application. All of the claims, i.e., claims 7 - 19 stand finally rejection and are on appeal. A copy of claims 7 - 19, which are on appeal, appear in the appendix hereto.

STATUS OF AMENDMENTS

No amendment was filed in response to the Final Rejection dated January 3, 2006.

SUMMARY OF THE INVENTION

The present invention relates to a vacuum processing apparatus for processing a wafer with plasma.

Independent claim 7, the only independent claim of this application, which is on appeal, recites a vacuum processing apparatus as generally illustrated in Fig. 1 of the drawings, for example, wherein as illustrated in Figs. 5 - 8 of the drawings of this application, the vacuum processing apparatus comprises a vacuum container in which an inside thereof is evacuated and in which a wafer is processed using plasma therein. As shown in Figs. 5 - 8 of the drawings, and as described in the paragraph bridging pages 23 and 24 of the specification, the vacuum container, as recited in claim 7 is represented by the members 511 and 512. As further recited in claim 7, there is also provided an inner chamber detachably disposed inside the vacuum container, which is represented by inner

chamber portions 509 and 510, for example, which portions are detachably removable from the vacuum container, in the manner illustrated in Figs. 7 and 8, and described at page 31, line 21 to page 32, line 14 of the specification. Claim 7 further recites the feature that the inner chamber has an inner space in which is disposed a wafer table, as represented by the table 504 in Fig. 5, for example, for supporting the wafer thereon, as described in the first full paragraph on page 24 of the specification. As further recited in claim 7, and as illustrated in Fig. 5, a processing gas line 501 supplies a processing gas to the processing chamber 500, as described at page 26 of the specification. Appellants note that the paragraph bridging pages 23 and 24 indicate that the outer chambers 511 and 512 define the vacuum container of the processing chamber 500 and more than one chamber is disposed inside the outer chambers 511 and 512 that constitute the outer walls of the processing chamber 500, creating a multiple chamber structure in which a chamber is disposed inside another chamber. As is readily apparent from Fig. 5, the inner chamber, as represented by the members 509 and 510, has an axisymmetric structure.

As further recited in claim 7, the inner chamber portion 509, as illustrated in Figs. 5 and 6, has a sidewall which delimits a part of the inner chamber, and which has an opening (not numbered) disposed therein, to which the wafer to be supported on the wafer table is passed, noting that as shown in Figs. 5 and 6, the opening is closed by a gate valve 513 which is provided to the inner chamber 509, and through which the wafer is to be transferred, as described at page 24 of the specification.

Claim 7 also recites the feature of a gate disposed so as to enable communication with the opening in the sidewall of the inner chamber so as to enable transfer of the wafer from outside of the vacuum container, i.e., outside of vacuum container portion 511, to the inner space of the inner chamber through the opening in the sidewall 509 of the inner chamber. As described in the first full paragraph at page 25 of the specification, a gate is disposed on the exterior chamber 511 constituting the vacuum chamber, to the area corresponding to and communication with the gate disposed on the transfer chamber 112 when the transfer chamber 112 and processing chamber 500 are connected. As described at page 25 of the specification, the location of this gate is determined so as not to interfere with the transfer of the wafer or the movement of the robot arm when wafers transferred by the robot arm or wafer transfer device 506, as shown in Fig. 5, within the transfer chamber 112.

Further claim 7 recites the feature of a valve disposed between the opening in the sidewall and the gate, the valve being movable with respect to the outside of the sidewall of the inner chamber so as to open and close the opening and for sealing the opening in an air tight manner. As described in the paragraph bridging pages 25 and 26 of the specification, a process gate valve 513 serves for opening and closing the process gate and is located in a space interposed between the outer chamber 511 and the inner chamber 509. The location and shape of the process gate is designed so that when the gate is designed so that when the gate is closed by the process gate valve 513, as illustrated in Figs. 5 and 6 of the drawings, the inner walls of the inner chamber

509 and 510 do not become uneven. Thus, as recited in claim 7, the portion of the valve has a shape which does not interfere with the axisymmetric structure of the inner chamber. The first full paragraph at page 26 of the specification describes the feature that the process gate valve 513 for closing the gate disposed on the innermost chamber 509 and the atmospheric gate valve 514 disposed on the outer chamber 511 are closed and sealed airtightly, as recited in claim 7.

Dependent claims 8 - 19 recite further features of the present invention. Claim 8 recites the feature that a portion of the valve 513 has a shape so that when the valve 513 closes the opening in the sidewall of the inner chamber 509, unevenness on an inner surface of the inner chamber is reduced noting that when a valve 513 is not present in the opening of the inner chamber, an unevenness of the sidewall is present and when the valve is provided therein, such unevenness is reduced as is apparent from the top view of Fig. 6 of the drawings. Claims 9 and 10 recite the feature of a driver connected to the valve for enabling movement of the valve, wherein the inner chamber is detachably disposed with respect to the vacuum container so as to enable lifting up of the inner chamber from the vacuum container. As shown in Figs. 5 and 7 and as described at page 25 of the specification, the process gate valve 513 is capable of being moved both in vertical and horizontal directions via a driving means 521 disposed below the valve 513, as shown in Fig. 5, and as shown in Fig. 7, the inner chamber 509 is detachably disposed with respect to the vacuum container 511 for example, so as to enable lifting up of the inner chamber 509 from the

vacuum container. It is noted that Fig. 8 shows the lifting up of the lower portion 510 forming the inner chamber. Claims 11 - 14 recite the feature that the valve 513 is movable in both vertical and horizontal directions, as described above. Claims 15 and 17 recite the feature of another valve disposed outside of the gate, the another valve being movable so as to open and close the gate and enable sealing of the gate in an airtight manner which is represented by the valve 513 which seals the opening in the vacuum container 511 as described in the paragraph bridging pages 24 and 25 of the specification. As illustrated in Fig. 7 and as recited in claims 16 and 18, the valve 514, when closing the gate enables sealing of the gate in an airtight manner while the inner chamber is removed from the vacuum container. See also Fig. 8. Claim 19 recites the feature that the valve 513 has a shape so that a portion thereof is insertable within the opening of the inner chamber for airtightly sealing the opening and to reduce unevenness on an inner surface of the inner chamber, as clearly illustrated in Figs. 5 and 6.

GROUND OF REJECTION TO BE REVIEWED ON APPEAL

Claims 7 - 19 stand rejected under 35 USC 103(a) as being unpatentable over US Patent No. 6,889,627 to Hao in view of US Patent No. 5,641,375 to Nitescu et al.

ARGUMENTS

Turning to Hao, appellants submit that the Examiner mischaracterized this patent as comprising "a vacuum container (Figs. 3A and 3B, 104) in which an inside thereof is evacuated and in which a wafer is processed using plasma

therein (col. 4, rows 6-10); an inner chamber (102) disposed inside the vacuum container and having an inner space in which a processing gas is supplied" (emphasis added). Appellants note that Hao does not describe "an inner chamber (102)", as contended by the Examiner. Rather, column 4, lines 35 - 38 of Hao describe Figs. 3A and 3B as "includes a liner 102, a process chamber 104, a valve chamber 106, a slot valve plate 108, a liner aperture 110, a rod 112, and an actuator 114". (emphasis added). Moreover, column 5, lines 5 - 10 of Hao defines the term "chamber" as referring to either the first chamber embodiment having a separate process chamber and a separate valve chamber or the second chamber embodiment having a combined process chamber and valve chamber. In any event, Hao recognizes that the member 102, which is characterized by the Examiner as "an inner chamber 102" (emphasis added) is not a "chamber", as described and claimed in this application or as disclosed and claimed in Hao, but rather a "liner 102" (emphasis added) which differs from a "chamber" and in particular, differs from the process chamber 104, as described by Hao. Thus, irrespective of the contentions by the Examiner, appellants submit that Hao does not disclose or teach "an inner chamber ... disposed inside the vacuum container and having an inner space in which a wafer table for supporting the wafer thereon is disposed ...". That is, the liner 102 of Hao is not an inner chamber, and it is not seen that a wafer table is disposed within the inner space of the inner chamber, as recited in claim 7. As such, appellants submit that claim 7 patentably distinguishes over Hao with respect to the provision of an inner chamber in the sense of 35 USC 103 and

should be considered allowable thereover with respect to this feature alone.

Since Hao does not provide an inner chamber as recited in claim 7, it is readily apparent that Hao also does not provide a sidewall delimiting a part of the inner chamber and having an opening disposed therein, a gate disposed in the manner set forth with respect to the inner chamber and vacuum container, nor a valve disposed between the opening in the sidewall and the gate, as recited.

More particularly, claim 7 recites the feature of "the valve being movable with respect to the outside of the sidewall of the inner chamber so as to open and close the opening and for sealing the opening in an airtight manner". (emphasis added). As shown in Figs. 5 - 7 of the drawings of this application, for example, in accordance with the present invention, the gate valve 513 has a configuration in which a portion of the valve 513 fills the opening in the sidewall of the chamber 509 and becomes flush with the inner portion of the sidewall of the inner chamber. On the other hand, an outer portion of the valve 513 extends beyond the opening of the sidewall so as to cover the opening and effect airtight sealing of the inner chamber, in the manner set forth in claim 7.

While the Examiner contends that the valve 110 of Hao seals the opening in an airtight manner, such feature is not disclosed or taught by Hao. As described in column 4, lines 56 - 64 and as clearly illustrated in Figs. 3A and 3B of the drawings of Hao, for example:

In the illustrative reactor 100, the slot valve plate 108 is configured to "sit on" the valve chamber 106 and covers the valve chamber aperture, the process chamber aperture and the liner aperture, thereby permitting the generation of a vacuum in the process chamber 104. The liner aperture plate 110 is configured to occupy

the liner aperture. The liner aperture plate 100 has sufficient clearance from the liner aperture to be able to move in and out of the liner aperture. (emphasis added).

Thus, Hao recognizes that a clearance between the liner aperture plate 110 and the liner aperture of the liner 102 is required, whereas for sealing purposes of the process chamber 104, the valve plate 108 is configured to "sit on" the valve chamber 106 so as to cover the valve chamber aperture. Appellants note that Fig. 3B of Hao evidences a clearance between the opening in the liner 102 and the aperture plate 110. Thus, Hao recognizes the difference in a structure which effects sealing of an aperture and one which does not effect sealing of an aperture, such that it is apparent that the aperture plate 110 of Hao does not effect sealing, as recited in claim 7, and the dependent claims of this application. Accordingly, appellants submit that claim 7 also patentably distinguishes over Hao with regard to the feature of sealing.

The Examiner recognizing that "Hao fails to explicitly teach the inner chamber is detachable disposed with respect to the vacuum container so as to enable lifting up of the inner chamber from the vacuum chamber" (emphasis added) refers to the patent to Nitescu et al. The Examiner contends that "Nitescu et al teach the use of a flexible, removable shield for plasma chamber for the purpose of protecting the inner walls of a plasma processing reactor (column 2, rows 10 - 18). The liner is liftable through the top of the reactor when the lid is removed so that the liner can be replaced (column 3, rows 25 - 31 and column 6, rows 28 - 34, 57-63)". (emphasis added). Thus, it is apparent that the Examiner recognizes that the "removable shield" of Nitescu et al corresponds to

the "liner" of Hao, and that neither the removable shield or liner of Nitescu et al nor the liner of Hao represent an "inner chamber" detachably disposed inside the vacuum container, with the other features as recited in claim 7 and the dependent claims.

Irrespective of this recognition by the Examiner, the Examiner continues to utilize "inner chamber" and "liner" interchangeably, which is contrary to the specific disclosures of Nitescu et al and Hao, in an attempt to provide the claimed features of claim 7 and the dependent claims by a hindsight reconstruction attempt which is not permissible in the sense of 35 USC 103.

That is, the Examiner states:

It would have been obvious to one of ordinary skill in the art at the time the Applicant's invention was made to have the inner chamber detachably disposed with respect to the vacuum container so as to enable lifting up of the inner chamber from the vacuum chamber in Hao in order to replace the protecting liner as taught by Nitescu et al. (emphasis added).

Turning to Nitescu et al, as recognized by the Examiner, this patent discloses a "removable shield" or "liner", which is not an "inner chamber", and as pointed out above, Hao also discloses the utilization of a "liner" which is not an "inner chamber", as claimed. Furthermore, in Nitescu et al, the shield or liner 38 is provided with two apertures, i.e., a slit valve opening 42 and the window opening 44. Neither of these openings or apertures are sealed in an airtight manner, but such apertures remain open, as disclosed in Nitescu et al. Thus, Nitescu et al, like Hao fails to provide a disclosure or teaching of a valve which seals the opening in an airtight manner, and has a shape which does not

interfere with the axisymmetric structure of the inner chamber, recognizing that neither Nitescu et al or Hao et al disclose a detachable inner chamber having the features as recited.

Appellants further note that Nitescu et al issued in 1997, and Hao is based upon a provisional application filed in 2001, some four years later. Assuming arguendo, that Hao adopted the teachings of a removable liner, it is readily apparent that the combination does not provide an inner chamber detachably disposed in a vacuum container and having the features, as recited with a valve airtightly sealing the inner chamber and configured in the manner set forth. Thus, appellants submit that claim 7 and the dependent claims patentably distinguish over the combination of Hao and Nitescu et al in the sense of 35 USC 103, and all claims should be considered allowable thereover.

With regard to the dependent claims, it is noted that such claims recite further features of the present invention. For example, claims 15 - 18 recite the feature of another valve disposed outside of the gate which enables sealing of the gate in an airtight manner. Appellants note that such another valve refers to the valve 514 as illustrated in the drawings of this application which covers and seals the vacuum chamber and would correspond to the valve 108 in Figs. 3A and 3B of Hao. Again, it is readily apparent that Hao recognizes that the aperture plate 110 does not effect sealing. In fact, looking to claim 1 of Hao, Hao recites the feature of "a liner having a liner aperture adapted to provide passage for a wafer; a chamber coupled to said liner, said chamber having a chamber aperture adapted to provide passage for said wafers; a slot valve plate

configured to cover said chamber aperture; a liner aperture plate configured to occupy said liner aperture." (emphasis added). Independent claim 8 recites the feature of the valve shape which is not disclosed in the cited art, while claims 9 and 10 recite the lifting up of the inner chamber, which is a processing chamber from the vacuum chamber and, as discussed above, such features are not disclosed in the cited art. Dependent claims 11 - 14 further recite the movement directions of the valve and claim 19 further recites features of the valve. Such features are not disclosed in the cited art. Thus, appellants submit that the dependent claims, when considered with the parent claims thereof, recite further features not disclosed or taught by Hao or Nitescu et al in the sense of 35 USC 103.

Appellants note that the claims recite structures using "accepted terminology" in the art, and the cited art also describes the structure thereof using "accepted terminology". However, the Examiner attempts to ignore the "accepted terminology" to apply the cited art to the claimed invention, which is not proper.

CONCLUSION

For the foregoing reasons, appellants request that the Examiner's rejections be reversed.

The Appeal Brief fee is submitted herewith.

Please charge any shortage in the fees due in connection with the filing of this paper, including extension of time fees, to the deposit account of Antonelli,

Terry, Stout & Kraus, Deposit Account No. 01-2135 (Case: 648.43120CX1), and
please credit any excess fees to said deposit account.

Respectfully submitted,

ANTONELLI, TERRY, STOUT & KRAUS, LLP

A handwritten signature in cursive script, appearing to read "Melvin Kraus", is written over a horizontal line.

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APPENDIX A

7. A vacuum processing apparatus comprising:

a vacuum container in which an inside thereof is evacuated and in which a wafer is processed using plasma therein;

an inner chamber detachably disposed inside the vacuum container and having an inner space in which a wafer table for supporting the wafer thereon is disposed and in which a processing gas is supplied, the inner chamber having an axisymmetric structure;

a side wall delimiting a part of the inner chamber and having an opening disposed therein through which the wafer to be supported on the wafer table is passed;

a gate disposed so as to enable communication with the opening in the side wall of the inner chamber so as to enable transfer of the wafer from outside of the vacuum container to the inner space of the inner chamber through the opening in the side wall; and

a valve disposed between the opening in the side wall and the gate, the valve being movable with respect to the outside of the side wall of the inner chamber so as to open and close the opening and for sealing the opening in an airtight manner, a portion of the valve having a shape which does not interfere with the axisymmetric structure of the inner chamber.

8. The vacuum processing apparatus according to claim 7, wherein a portion of the valve has a shape so that when the valve closes the opening in the

side wall unevenness on an inner surface of the inner chamber is reduced.

9. The vacuum processing apparatus according to claim 7, further comprising a driver connected to the valve for enabling movement of the valve, wherein the inner chamber is detachably disposed with respect to the vacuum container so as to enable lifting up of the inner chamber from the vacuum container.

10. The vacuum processing apparatus according to claim 8, further comprising a driver connected to the valve for enabling movement of the valve, wherein the inner chamber is detachably disposed with respect to the vacuum container so as to enable lifting up of the inner chamber from the vacuum container.

11. The vacuum processing apparatus according to claim 7, wherein the valve is movable in both vertical and horizontal directions.

12. The vacuum processing apparatus according to claim 8, wherein the valve is movable in both vertical and horizontal directions.

13. The vacuum processing apparatus according to claim 9, wherein the valve is movable in both vertical and horizontal directions.

14. The vacuum processing apparatus according to claim 10, wherein the valve is movable in both vertical and horizontal directions.

15. The vacuum processing apparatus according to claim 7, further comprising another valve disposed outside of the gate, the another valve being movable so as to open and close the gate and enable sealing of the gate in an airtight manner.

16. The vacuum processing apparatus according to claim 15, wherein the another valve when closing the gate enables sealing of the gate in an airtight manner while the inner chamber is removed from the vacuum container.

17. The vacuum processing apparatus according to claim 8, further comprising another valve disposed outside of the gate, the another valve being movable so as to open and close the gate and enable sealing of the gate in an airtight manner.

18. The vacuum processing apparatus according to claim 17, wherein the another valve when closing the gate enables sealing of the gate in an airtight manner while the inner chamber is removed from the vacuum container.

19. The vacuum processing apparatus according to claim 7, wherein the valve has a shape so that a portion thereof is insertable within the opening of

the inner chamber for airtightly sealing the opening and to reduce unevenness on an inner surface of the inner chamber.